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EXAMINER
NGUYEN, PHILLIP H

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
	10/768,804	RUBIN ET AL.
Office Action Summary	Examiner	Art Unit	
	Phillip H. Nguyen	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>22 July 2008</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-21</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-21</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date <u>09192008</u>.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   This action is in response to the amendment filed on 7/22/2008.

2.   Claims 1-21 remain pending in this application with claim 1 has been amended.

Response to Amendment

3.   The prior rejection to claims 1 and 8 under 112, second paragraph is hereby

withdrawn in view of applicant's amendment.

Response to Arguments

4.   Applicant's arguments filed 7/22/2008 have been fully considered but they are

not deemed persuasive.

Applicants assert on pages 9-10 of the amendment that Ng fails to teach

"*superword registers*" and "*value number corresponds to a superword components*" as

recited in the independent claims 1 and 10.

Examiner respectfully disagrees with the allegation as argued. Although, the

"superword register" is recited in the claims but the applicant is required to further

amend the claim to clarify the "superword register" to make a distinction from any

normal registers of the Central Processing Unit (CPU). Furthermore, the claims recite

only single (i.e., **a**) value number but the "superword register" stores multiple results. Thus, examiner interprets the "superword register" as any normal register of the CPU.

The applicants admitted that a prior art performs hashing value numbering using the "superword register". Even though, the register result is treated as a single value and the individual components of the register are ignored, but the single value is corresponding to components of the "superword register" (see the specification [0009]).

Applicants assert on pages 10-12 of the amendment that Ng fails to teach "*generating a results value number based on previous value number and the operation value number, wherein the said result value number is a combination of operation value numbers*" as recited in the independent claims 1 and 10.

Examiner respectfully disagrees with all the allegations as argued.

Ng teaches "*hashing for x2+y0 obtains two different values for x0+y0 and x1+y0, respectively*" (see col. 6:13-14). According to Ng, a value number is a hash value number of a hashed instruction, which is also an operation value number or a result value number as recited in the claims.

Ng further teaches "*Each time a new value number is formed, the expression is entered into the hash table. Value numbers and value number lists are evaluated and created using the following rules…If the value numbers are not equal, then a new value number is formed and assigned if not already assigned*" (see col. 8:7-28).

According to Ng, a new value number (i.e., a result value number) is generated based on the previous value numbers and incoming value number of the expression.

Applicant's specification and FIG. 4 further describes the operation value number and the result value number. The specification [0039] discloses "...If the component is to be effected, a result value number 196 for that component is the operation value number for that component..."

. There are four different value numbers recited in the independent claims, such as "value number", "first hash value", "operation value number" and "result value number" and the examiner does not know how to distinguish them from each other. For example, what is the difference between the first hash value and the operation value number? Since, the operation value number is retrieved from a hash table, they can be the same value number. The same with the result value number, examiner does not know how to distinguish it from other value numbers.

Allowable Subject Matter

5.   Claims 8, 16, and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

6.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7.   Claims 1 and 8 recite the limitation "the instruction" in the body of the claims,

there is insufficient antecedent basis for this limitation in the claim. Claims 2-9 directly

or indirectly depend on claim 1 and therefore suffer the same deficiency.

Claim Rejections - 35 USC § 102

8.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9.   Claims 1-7, 9-15, and 17-20 are rejected under 35 U.S.C. 102(b) as being

anticipated by Ng (USPN 6,035,124).

<u>As per claims 1 and 10:</u>

        Ng teaches:

        hashing an operation code and corresponding value numbers to generate

a first hash value (see at least col. 6, lines 13-14 "hashing for x2+y0 obtains two

different values for x0+y0 and x1+y0, respectively" also see at least "***TABLE A***"

for more details);

        retrieving an operation value number from a first hash table based on the

first hash value wherein said operation value number corresponds to

components contained by a superword register (see at least col. 7:51-52 "A Hash

table is used to speed up the storing and **retrieval of value numbers**"; see also

col. 7:6-9 "The Value Number List of an incoming expression is computed and

compared with the Value Number List of a current expression. If the two VNlists

match in value, and in order, then the expression is redundant...");

generating a result value number based on a previous bit hash value and

the operation value number wherein said result value number is a combination of

operation value numbers (see at least col. 8:7-28 "Each time a new value

number is formed, the expression is entered into the hash table. Value numbers

and value number lists are evaluated and created using the following rules...If the

value numbers are not equal, then a new value number is formed and assigned if

not already assigned"); and

determining if the instruction is redundant by searching a second hash

table using the result value number (see at least col 5:57-64 "**A hash table**,

illustrated in FIG. 6 and described below in the section entitled "**Hash Table", is**

used for fast access in Extended Global Value Numbering. This hash table

reduces the **search time** and space needed later for **redundancy removal**.

This **hash table also enables the searches to be done** with "context" and in a

predictive manner, as opposed to conventional methods in which all expressions

were attempted to be moved upwards"; see also col. 7:51-52 "A **Hash table** is

used to speed up the **storing and retrieval of value numbers**. The hash key

consists of the op-code plus all its operands" - In other words, Ng's approach

uses hash table for performing value numbering to identify expressions (i.e.

instructions) that are candidates for redundancy removal).

As per claims 2 and 11:

  Ng further teaches:

    when the result value number is found within the second hash table,

retrieving an output of the instruction from the second hash table (see at least

col. 9:36-38 "if a value number has been assigned to the LHS (left hand side),

then processing continues to decision block 525 to determine if any right hand

side (RHS) operands of the current expression have an unknown value number"

– In other words, if a value number is found, a determination of RHS operands is

performed, and in order to perform the determination, the value number of the

operands must retrieve from the hash table to compare).

As per claims 3 and 12:

  Ng further teaches:

    when the result value number is not found within the second hash table,

writing the result value number to the second hash table (see at least col. 9:22-

24 "if no value number has been assigned to the LHS (left hand side), then

process block 520 creates and assigns a new unique value number to the LHS").

As per claims 4 and 13:

  Ng further teaches:

prior to generating a result value number, retrieving the previous value number (see at least col. 8:27-28; it is inherent in Ng's method. In order to generate a new value number, previous bit hash value must retrieve to perform the comparison).

As per claims 5 and 14:

Ng further teaches:

prior to retrieving the operation value number, comparing the first hash value with a first hash table (see at least col. 8:27-28; it is inherent in Ng's method. In order to generate a new value number, a comparison between the hash value numbers with the hash table must perform to find out if it is redundant).

As per claims 6, 15 and 20:

Ng further teaches:

when the first hash value is not within the first hash table, assigning the first hash value a multiple component hash value (see at least col. 8:27-28 "if value numbers not equal, then a new value number is formed and assigned if not already assigned").

As per claim 7:

Ng further teaches:

wherein the operation value number is an n-tuple number (see at least col.

6:3 "xi (i.e., x0, x1, x2,...)"; see also at least col. 6:51-54 "All expressions that

look lexically the same (e.g., x0+y0, x1+y1, x2+y2) together with all other

expressions sharing the same value numbers with these lexically similar

expressions").

As per claim9:

Ng further teaches:

wherein the instruction further including a previous bit and a write mask

(see for example, FIG. 6, and texts for further expanding its features; see also at

least col. 9:20-67 "Hash Table").

As per claim 17:

Ng further teaches:

a superword register operably coupled to the processor, the superword

register operative to store a plurality of instructions therein (see at least FIG. 10).

As per claim 18:

Ng further teaches:

at least one hash memory device operably coupled to the at least one

processor such that the at least one hash memory device is operative to store

the first hash table and the second hash table (see at least FIG. 10).

As per claim 19:

Ng further teaches:

hashing an operation code and corresponding value numbers to generate a first hash value (see at least col. 6:13-14 "hashing for x2+y0 obtains two different values for x0+y0 and x1+y0, respectively"; also see "TABLE A" for more details);

comparing the first hash value with a first hash table (see at least col. 8:27-28; it is inherent in Ng's method. In order to generate a new value number, a comparison between the hash value number with the hash table must perform to find out if it is redundant);

retrieving an operation value number from the first hash table (see at least col. 7:51-52 "A hash table is used to speed up the storing and retrieval of value numbers"; also see at least col. 8:27-28 "if value numbers are not equal, then a new value number is formed and assigned if not already assigned" – In other words, retrieving the value number from the hash table must performed in order to compare the value numbers);

retrieving a previous value number (see at least col. 8:27-28; it is inherent in Ng's method. In order to generate a new value number, previous bit (can be previous value number or opcode or any operand value) hash value must retrieve to perform the comparison);

generating a result value number based on the previous value number and the operation value number wherein the said result value number is a combination of operation value numbers (see at least col. 8:7-28 "Each time a new value number is formed, the expression is entered into the hash table. Value numbers and value number lists are evaluated and created using the following rules...If the value numbers are not equal, then a new value number is formed and assigned if not already assigned");

searching a second hash table using the result value number (see at least col. 10:26 "redundancy may be determined by a lookup each time any code is moved");

if the result value number is found within the second hash table, retrieving an output of an instruction from the second hash table (see at least col. 9:36-38 "if a value number has been assigned to the LHS (left hand side), then processing continues to decision block 525 to determine if any right hand side (RHS) operands of the current expression have an unknown value number" – In other words, if a value number is found, a determination of RHS operands is performed, and in order to perform the determination, the value number of the operands must retrieve from the hash table to compare); and

if the result value number is not found within the second hash table, writing the result value number to the second hash table (see at least col. 9:22-24 "if no value number has been assigned to the LHS (left hand side), then process block 520 creates and assigns a new unique value number to the LHS").

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip H. Nguyen whose telephone number is (571) 270-1070. The examiner can normally be reached on Monday - Thursday 10:00 AM - 3:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y. Zhen can be reached on (571) 272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PN
10/8/2008
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